Name: _____ Student Number: 930772

Section: (Grassman) Callele

CMPT260 Midterm Examination
November 1, 2001
Closed Book, Four sheets of notes allowed.

1. Given the argument: $A \Rightarrow (B \Rightarrow C) \ |\!- \ (A \wedge B) \Rightarrow (B \wedge C)$

✓a) *(5 marks)* Provide a formal proof of this argument drawing only from the Deduction Theorem (DT), Modus Ponens (MP), Law of Simplification (LS), and the Law of Combination (LC). *HINT:* Use $A \wedge B$ as an assumption.

$A, A \Rightarrow B \models B$	Modus Ponens
$A \wedge B \models A$	Law of Simplification
$A, B \models A \wedge B$	Law of Combination

✓b) *(3 marks)* Restate the argument, removing all implications. Simplify and show that the premises are truth functionally equivalent to the conclusion.

2. Given the predicate $(\forall x(P(x) \Rightarrow Q(x))) \Leftrightarrow (\exists x(P(x)) \Rightarrow \forall x(Q(x)))$

a) *(4 marks)* Give an assignment that makes the predicate True

b) *(4 marks)* Give an assignment that makes the predicate False

3. Translate the following sentences into ~~propositional~~ predicate calculus.

a) *(2 marks)* All lions are mammals, but not all mammals are lions.

b) *(3 marks)* Except for John, everyone had a good time at Halloween.

✓4. *(3 marks)* Let the operator ° be defined as follows. Find $(x \circ (y \circ z)) \circ x$ where $x = a$, $y = c$, and $z = b$.

	a	b	c
a	a	b	b
b	a	c	b
c	c	a	b

5. *(6 marks)* Write a Prolog procedure `find(N, List, Value)` that succeeds if Value is the N^{th} element of List.

6. *(4 marks)* Write a Prolog procedure `same(List1, List2)` that succeeds if the two lists have at least one element in common. *Hint:* You only need to use the member procedure studied in class.

✓7. *(3 marks)* Give the composition R°S: A↔B of A, B, and C where R: A↔C and S:C↔B and

A={a,b,c}, B={3,2,1}, C={x,z,y}

R={(a,z),(b,y),(c,x)}

S= {(z,3),(y,2),(x,1)}